MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019 / 2020

TBS2251 – BUSINESS STATISTICAL ANALYSIS

10 MARCH 2020
2.30 p.m. - 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 6 printed pages excluding the cover page.
2. Attempt **ALL** questions.
3. The distribution of the marks for each question is given.
4. Please write all your answers clearly in the answer booklet provided.

Answer ALL questions.

QUESTION 1 (10 MARKS)

The Impact of Poor Forecasting Techniques on the Retail Supply Chain

by Sahir Anand, 18 October 2018

New research by EnsembleIQ suggests that retail supply chain professionals navigate many hurdles and hazards, including demand forecasting-related challenges such as real-time visibility into supply chain inventory, unforeseen market risks, and a lack of forecast accuracy. To stay on track, they rely on a range of replenishment strategies, primarily demand-based replenishment, store-to-store, and vendor managed inventory, while continually looking for ways to improve. Six in 10 retailers, in fact, report that they are taking steps to increase inventory visibility and reduce cycle times, according to the "Strengthening the Retail Supply Chain: A Survey of 50 Leading U.S. Retailers" report.

Beyond outside business pressures, what keeps retail supply chain professionals up at night? Many cite concerns about clarity and confidence involving demand forecasting, both in their own business processes and toward the market as a whole. The top responses include a lack of real-time visibility into supply chain inventory (43%) followed by unforeseen market risks (40%). Many also report a lack of forecast accuracy (34%). These challenges are consistent across professionals in small, medium and large formats, suggesting these issues are at the fore in every area of retail.

Most retail supply chain professionals give high marks to allocation and inventory planning capabilities, with either rated good or very good by eight in 10 survey respondents. Forecasting capabilities earn less enthusiastic reviews: Just six in 10 consider the technology enabling their supply chain forecasts to be good or very good.

Any growth-minded business knows that staying ahead of the pack requires keeping on top of the latest innovations. For retail supply chain technology investments, organizations are most inclined to spend on systems that help increase stock availability and decrease stock holding (58%). Software that reduces time spent digging through data is also worthy of investment — 52% of retail supply chain professionals say their organization will invest in capabilities that cut down on number crunching — as is anything that helps companies keep pace with expansion. Forty-four percent invested in new technology because their old systems couldn't cope with growth.

As retailers ramp up their efforts to leverage the latest technology in all areas of supply chain management, innovations in artificial intelligence are poised to enhance every link within the chain. The artificial intelligence (AI)-powered supply chain will operate on a single, unified platform in which each link supports and strengthens the others.

AI holds enormous potential to improve supply chain efficiency, and forward-looking retailers already have begun investing in these technologies. One in three say they have implemented AI capabilities into their supply chain management processes, and one in four are working toward that goal.

Source: *https://risnews.com/impact-poor-forecasting-techniques-retail-supply-chain*

a) Based on the article,

     i.   what are the challenges faced by retail supply chain?   (2 marks)

     ii.   suggest **THREE (3)** ways of gaining a competitive advantage in retail supply chain.   (3 marks)

b) Describe **THREE (3)** challenges of applying business analytics.   (3 marks)

c) Distinguish between predictive analytics and prescriptive analytics.   (2 marks)

QUESTION 2 (10 MARKS)

a) A toy manufacturer is preparing to set the price on a new toy model. Demand (D) is thought to depend on the price (P) and is represented by the model $D = 81 - P$

The accounting department estimates that the total costs (C) can be represented by $C = 243 + D$

Develop a mathematical model for the total profit (F) in terms of the price, P.

     (4 marks)

b) Based on the information in part (a), a visual model for profit in terms of the price, P has been developed as follows:

Continued......

Visual Model for Profit vs Price
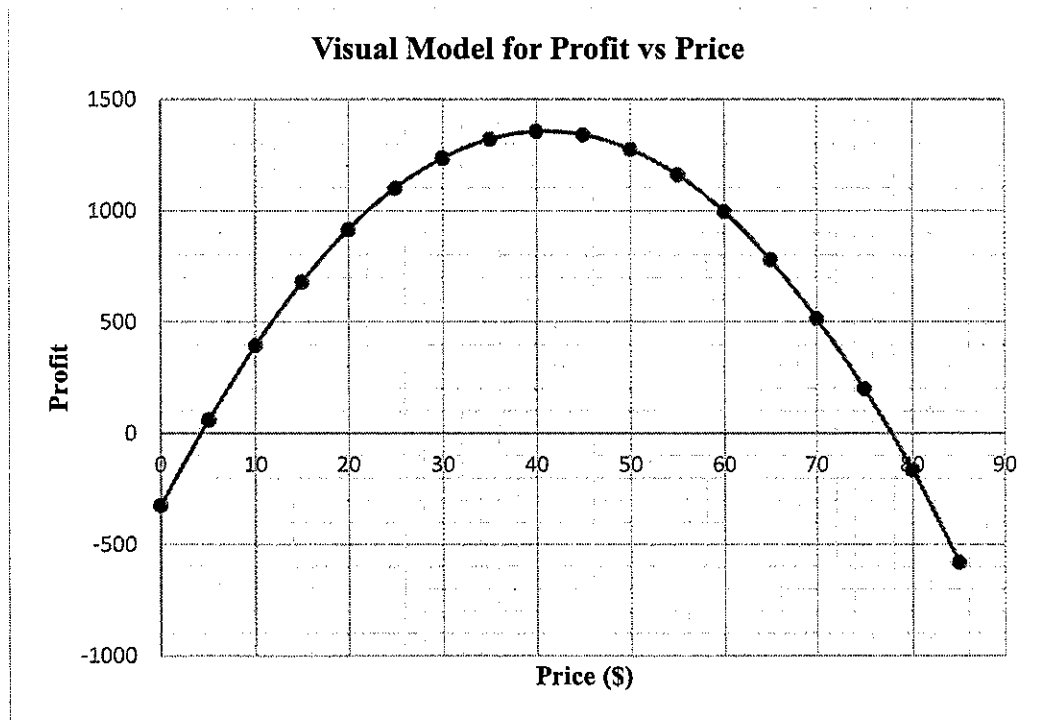
Based on the visual model,

i.   suggest the minimum selling price for a positive net profit. (Round up your answer to an integer)   (1 mark)

ii.   suggest the selling price for a maximum profit.   (1 mark)

c)   Based on a sample size of 950, a political candidate finds that 508 people would vote for him in a two person race, an analysis has been carried out at 95% confidence interval for his expected proportion of the vote. The results are as follows:

Sample size	950
Voting for the candidate	508
Sample proportion	0.535
Alpha	0.05
z-value	1.96
Standard error	0.0162

i.   Find the 95% confidence interval for his expected proportion of the vote.

                                                                (2 marks)

ii.   Based on your answer in part (c.i), explain whether he would be confident of winning based on this poll.   (2 marks)

Continued......

QUESTION 3 (10 MARKS)

a)   Data were collected from a manufacturing process for a mechanical part in which the dimensions are specified as 5.00 ± 0.4 centimeters. The descriptive statistics analysis results are as follows:

Manufacturing Measurements	
Mean	5.077
Standard Error	0.028
Median	5.225
Mode	5.46
Standard Deviation	0.399
Sample Variance	0.159
Kurtosis	-1.162
Skewness	-0.473
Range	1.47
Minimum	4.26
Maximum	5.73
Sum	1015.45
Count	200

i.   Based on the descriptive statistics analysis results, describe the shape of the distribution of the mechanical part dimensions.   (3 marks)

ii.   A histogram of these data is constructed as follows:
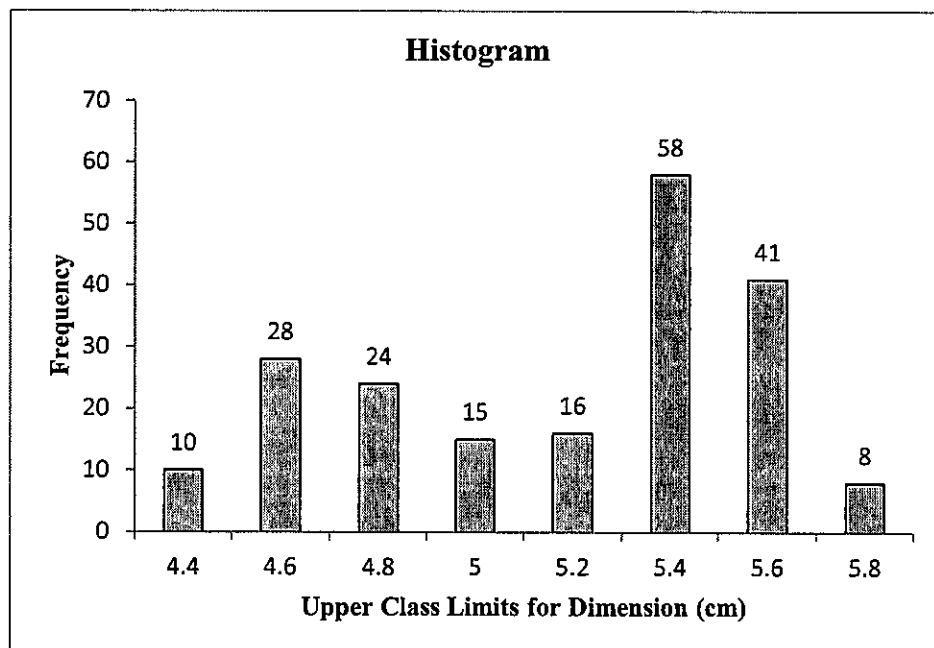
Interpret the results in terms of percentage of defective for this manufacturing process. What can you conclude?   (3 marks)

Continued......

b)   Distinguish between judgment sampling and convenience sampling. (2 marks)

c)   Briefly discuss how to improve the power of test in hypothesis testing.
                                                                          (2 marks)

QUESTION 4 (10 MARKS)

a)   Airline revenue management system works in real time with one aim — to boost
        revenues. The decisions are being made by an algorithm that adjusts fares by
        using information including past bookings, remaining capacity, average demand
        for certain routes and the probability of selling more seats. At any date prior to
        a scheduled flight, airlines must make a decision as to whether to reduce ticket
        prices to stimulate demand for unfilled seats. If the airline does not discount the
        fare, empty seats might not be sold and the airline will lose revenue. If the airline
        discounts the remaining seats too early, they could lose profit as the seats could
        have sold at a higher price. Assume that on a given day, only two fares are
        available: full and discount. The decision depends on the probability p of selling
        a full-fare ticket if they choose not to discount the price. If a full-fare ticket costs
        $1 200 and the discount fare is $900 with the probability p of selling a full-fare
        ticket is 0.70,

        i.   explain the rationale of decision making in this case.   (4 marks)
        ii.   find the value of p for a break-even point.   (1 mark)
        iii.   When is it beneficial to discount?   (1 mark)

Continued......

b)   A company director claimed that the average number of years of service is the same for males and females in his company. A survey was conducted and the data analysis results of this survey conducted at a level of significance of 0.05 are as follows:

t-Test: Two-Sample Assuming Unequal Variances

	Females	Males
Mean	10.053	18.75
Variance	16.164	62.733
Observations	19	16
Hypothesized Mean Difference	0	
df	21	
t Stat	-3.982	
P(T<=t) one-tail	0.000	
t Critical one-tail	1.721	
P(T<=t) two-tail	0.001	
t Critical two-tail	2.080	

     i.   State the hypotheses to test.   (2 marks)
    ii.   Based on the analysis results, verify the director's claim with p-value approach.   (2 marks)

QUESTION 5 (10 MARKS)

a)   Suppose that a car-rental agency offers insurance for a week that costs $500. A minor fender bender will cost $1000, whereas a major accident might cost $8 000 in repairs. Without the insurance, you would be personally liable for any damages. This means there are two decision alternatives: take the insurance, or do not take the insurance. The uncertain consequences, or events that might occur, are that you would not be involved in an accident, that you would be involved in a fender bender, or that you would be involved in a major accident.

     i.   Develop a payoff table for this situation.   (4 marks)
    ii.   Compare the decision should you make using the aggressive and the opportunity-loss strategies.   (2 marks)

b)   When assumptions of regression are violated, then statistical inferences drawn from the hypothesis tests may not be valid. Thus, before drawing inferences about regression models and performing hypothesis tests, these assumptions should be checked. Briefly discuss any **TWO (2)** processes of checking assumptions in these tests.   (4 marks)

End of Page